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OPTIMUS EPS
BY SEASTAR

BAYSTAR[™]

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OPERATION INSTRUCTIONS

AND USER'S MANUAL

www.seastarsolutions.com



OPTIMUS EPS
BY SEASTAR

Electronic Power Steering for
Outboard, Sterndrive, and Small
Inboard Powered Vessels



*Before you do it your way,
please try it our way*

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**California
Proposition 65 Warning**

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.


Wash hands after handling.

Thank you for choosing an Optimus™ Electronic Power Steering System by SeaStar Solutions. You have chosen a state of the art steering system that will provide years of effortless and trouble free steering performance.

About this Book

This User's manual contains the information you need to safely operate and maintain your steering system. It must remain on the boat.

Notice to the Operator

Throughout this publication, Dangers, Warnings and Cautions (accompanied by the International Hazard Symbol ) are used to alert the user to special instructions concerning a particular service or operation that may be hazardous if ignored or performed incorrectly or carelessly. **Observe them carefully!**

These safety alerts alone cannot eliminate the hazards that they signal. Strict compliance with these special instructions during installation, operation, and maintenance, plus common sense operation, are important measures to prevent accidents.

Failure to adhere to these notices may result in the loss of steering control, leading to possible ejection from the vessel, causing property damage, injury and/or death.

DANGER

IMMEDIATE HAZARDS WHICH, IF NOT ACTED UPON, WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH.

WARNING

HAZARDS OR UNSAFE PRACTICES WHICH, IF NOT ACTED UPON, COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

CAUTION

Hazards or unsafe practices which could result in minor injury or product or property damage.

NOTICE

Information which is important to proper use or maintenance, but is not hazard-related.

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ABBREVIATIONS

The following abbreviations are used in this manual:

ABYC	American Boat & Yacht Council
AP	Autopilot
CAN	Controller Area Network
EPS	Electronic Power Steering
GPS	Global Positioning System
INFO	Information
HI	High
LO	Low
MPH	Miles Per Hour
NMEA	National Marine Electronics Association
NMEA 2000®	A protocol for digital communication on a CAN Bus
PCM	Pump Control Module
RFU	Rudder Feedback Unit
RPM	Revolutions Per Minute
STBD	Starboard (right)

Note: Some abbreviations not listed here may be found in their respective sections.

1.0 SAFETY INFORMATION

WARNING

THE SAFETY INFORMATION PROVIDED BELOW IS INTENDED TO INFORM YOU OF THE DANGERS THAT MAY BE PRESENT BEFORE, DURING AND AFTER USE. IT IS CRITICAL THAT YOU READ AND UNDERSTAND ALL THE POINTS NOTED.

WARNING

THE OPTIMUS EPS SYSTEM MUST ONLY BE INSTALLED BY AN AUTHORIZED DEALER OR OEM.

Safe operation of the steering system depends upon proper installation and maintenance of the system, and the common sense, safe judgment, knowledge, and expertise of the operator. Every installer and operator of the steering system should know the following requirements before installing or operating the steering system.

If you have any questions regarding any of these warnings, contact SeaStar Solutions.

To reduce the risk of severe injury or death:

1. Always wear a Coast Guard Approved personal flotation device (PFD) and use an engine shut-off cord (lanyard).
2. Read and understand this User's manual and the Quick Reference Card provided with your vessel control components.
3. SeaStar and Optimus components are highly engineered and safety tested to ensure system integrity. DO NOT substitute any component. Substitution with non-SeaStar or non-Optimus components may compromise system safety, performance, and reliability.

Prior to every use

Perform a system inspection as outlined below. Refer to Section 3.3 for further details.

1. Check steering fluid level in all steering pumps.
2. Verify immediate steering response when turning steering wheel(s).
3. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.
4. Check for binding, loose, worn or leaking steering or shift/throttle control components.
5. Verify proper shift and throttle response for all control levers.
6. Verify that no alarms or warnings are shown on the CANtrak display.

WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

1.0 Safety information (continued)

During use

1. WEAR A COAST GUARD-APPROVED PERSONAL FLOTATION DEVICE (PFD).
2. Attach engine shut-off cord (lanyard) to your pfd.
3. Never allow anyone not familiar with the operation of the vessel control system to operate the boat at ANY time.
4. Know and adhere to all applicable federal, state, and municipal laws and regulations that govern boating in your area.

WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

WARNING

DO NOT OPERATE THE VESSEL WITHOUT A FUNCTIONING CANTRAK DISPLAY. ON SINGLE-ENGINE VESSELS NOT EQUIPPED WITH A CANTRAK DISPLAY, DO NOT OPERATE WITHOUT A FUNCTIONING DASH PANEL WARNING LAMP AND BUZZER.

After use

Rinse off the SmartCylinders thoroughly, using only fresh, clean water. (Outboard-powered vessels only.)

DO NOT rinse the PCM, pumps, actuators, or any other component of the Optimus system.

DO NOT use acetone, or cleaners containing ammonia, acids, or any other corrosive ingredients on any Optimus components.

Maintenance

Maintain your Optimus Steering as directed in Section 7 of this manual. Keep our waters clean for all current and future users. Dispose of all fluids in accordance with your local regulations.


1.1 Safety Labels

⚠ WARNING

NOTE: THE LABELS BELOW SHOULD CALL ATTENTION TO THE POSSIBLE HAZARDS ASSOCIATED WITH THE EQUIPMENT SHOWN LATER IN THIS MANUAL (SEE SECTION 3.1)

Hydraulic Pump Labels

**⚠ CAUTION
HOT**



HYDRAULIC STEERING PUMP

PART No. EP1500	SERIAL NO:
6.9 MPa (1000psi) MAX. 12 Volt	12-100001

⚠ WARNING

DO NOT OPEN VALVE WITH ENGINE(S) RUNNING

⚠ WARNING

Prior to use check fluid level in pump reservoirs. Install and maintain in accordance with SeaStar Solutions installation manuals. Use SeaStar Electronic Power Steering Fluid ONLY. NEVER use brake fluid. Any non-approved fluid may cause irreparable damage resulting in loss of steering control and may void warranty. Failure to comply with the above warnings may result in loss of steering control, leading to possible ejection from vessel causing property damage, personal injury and/or death.

STEERING SERVICE VALVE

Refer to User's Manual for use of valve.

OPERATION:

- TURN OFF ENGINES
- FULLY TURN KNOB COUNTER-CLOCKWISE TO OPEN
- MANUALLY MOVE ENGINE(S) TO REPOSITION
- FULLY TURN KNOB CLOCKWISE TO CLOSE

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CE

SEASTAR SOLUTIONS
RICHMOND, BC, CANADA

061289

Figure 1-1. Hydraulic steering pump labels.

Pump Control Module (PCM) Labels

CAN 1

CAN 1


MODEL NUMBER:

CAN 3

CAN 2


PUMP CONTROL MODULE

EM1200



RFU 1

SERIAL NUMBER:



⚠ WARNING

REFER TO INSTRUCTIONS FOR SPECIFIC APPLICATION. INSTALL AND MAINTAIN IN ACCORDANCE WITH SEASTAR SOLUTIONS INSTRUCTIONS. FAILURE TO COMPLY WITH ABOVE MAY RESULT IN LOSS OF STEERING CONTROL, LEADING TO POSSIBLE EJECTION FROM VESSEL CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

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SAE J1171, Patent Pending

12V/24V

Figure 1-2. PCM labels.

SmartCylinder Label

SEASTAR SOLUTIONS RICHMOND, BC, CANADA	PART # EC5310, 6.9 MPa (1000psi) MAX SMART STEERING CYLINDER	ISO10592 Patents Pending CE ABYC
PRIOR TO EVERY USE: 1. Check fluid level in pump reservoirs (consult User's Manual). 2. Verify immediate steering response when turning steering wheel(s). 3. Inspect all steering hoses, fittings & cables for wear, kinking and/or leaks. 4. Check for binding, loose, worn or leaking steering components. DO NOT operate boat if any component is not in proper working condition.		INSTALLATION, USE AND MAINTENANCE: 1. Ensure steering cylinder is compatible with outboard engine & U.S.C.G. ratings. 2. Interference with any object MUST be corrected prior to use. 3. Maintain steering system at a minimum of twice per year. 4. Refer to Installation and User's Manuals for important safety information. 5. Ensure all electrical connections are properly secured and free from corrosion. 6. Keep magnets away from steering cylinders.
⚠ WARNING Failure to adhere to these warnings may result in loss of steering control, leading to possible ejection from vessel causing property damage, personal injury and/or death. www.seastarsolutions.com 682009		

Figure 1-3. SmartCylinder labels.

Steering Service Valve Labels

To be installed close to the service valve.

STEERING SERVICE VALVE

OPERATION:

- TURN OFF ENGINES • OPEN VALVE
- MANUALLY MOVE ENGINE(S) TO REPOSITION • CLOSE VALVE

⚠ WARNING

DO NOT OPEN VALVE WITH ENGINE(S) RUNNING

FAILURE TO COMPLY WITH THE ABOVE MAY RESULT IN LOSS OF STEERING CONTROL LEADING TO POSSIBLE EJECTION FROM VESSEL CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

214461

Figure 1-4. Steering service valve label.

Ignition Connection Label

⚠ WARNING

**Avoid loss of control:
Ensure proper connection per instructions.**

⚠ WARNING

**Avoid loss of control:
Ensure proper connection per instructions.**

682300

Figure 1-5. Ignition warning decal, PID# 682300.

2.0 INTRODUCTION

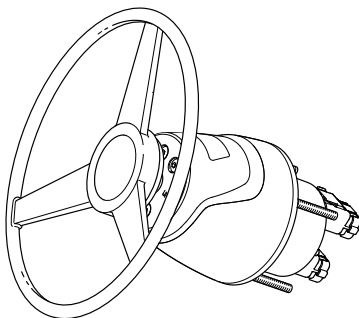
2.1 Welcome

Welcome to the world of electronic power steering. Please take a few minutes to familiarize yourself with the System Overview and the First Time Operation sections. An understanding of the system will assure your safety and help you get the most enjoyment from your Optimus EPS steering system.

2.2 Optimus EPS System Overview

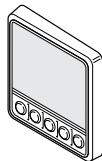
Optimus EPS is a steer-by-wire system that replaces a traditional hydraulic helm with electronic components that communicate over a serial data network. This state-of-the-art system incorporates many advanced features to make it safe and reliable. These features include redundant sensors, fault-tolerant communications, extensive self-monitoring, and fault communications to notify and advise the operator in case of a system fault.

The Optimus EPS system consists of several major components, listed below. Refer to figure 2-1 through figure 2-4 to see these components in a schematic system diagram.



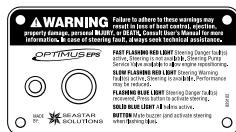
Electronic helm

The helm converts steering wheel movement into digital messages that are sent over the network to the pump control module (PCM). A system of friction plates in the helm allow the steering effort to be adjusted according to a setpoint received from the PCM. (A steering wheel is not included with the Optimus EPS system.)



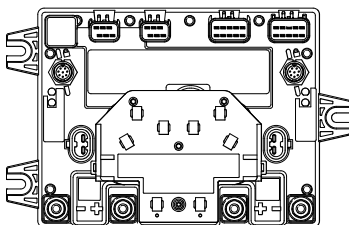
CANtrak display

The CANtrak display is a small color LCD that displays system status and fault information to the operator. It can also be used to make changes to user-adjustable steering settings, such as helm effort and number of turns, when enabled by the boat builder or dealer.



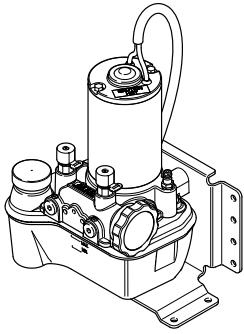
Dash Panel

Standard on single-engine outboard systems, the dash panel has an LED to indicate system status and a pushbutton for alarm acknowledgment.



Pump control module (PCM)

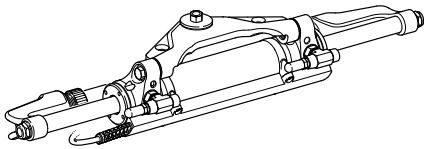
The PCM receives wheel movement messages from the helm(s) and operates the hydraulic steering pumps to steer the vessel as required. The PCM uses position feedback from the SmartCylinders for precise steering control and fault detection. The PCM can also respond to inputs from a certified autopilot system.



Power steering pumps

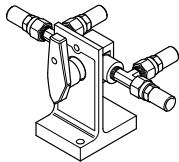
The power steering pumps supply pressurized fluid to the SmartCylinders in order to steer the boat. The PCM controls a 12V DC motor that drives a small gear pump. The pump assembly has an integral fluid reservoir and pressure relief valves.

The steering pumps have an integral service valve that can be opened to bypass the pumps and allow the engines to be manually repositioned. They are used for service or in the case of an emergency.



SmartCylinders

The SmartCylinder is a hydraulic steering cylinder fitted with a magnet and a position sensor (RFU). Each SmartCylinder can steer a single outdrive, or up to two rudders or outboard engines connected with a tie-bar.



Remote-mounted steering service valves (optional)

When the service valves on the power steering pumps are not easily accessible these optional remote-mounted valves can be installed in a convenient location.

2.3 System Diagrams

The figures on the following pages illustrate the Optimus EPS system schematically. Not every possible system configuration or cylinder type can be represented here, but these figures will illustrate the key components and connections.

Single-Engine Systems

Figure 2-1 illustrates a single-engine EPS system with the standard dash panel. Figure 2-2 shows the same system, but with the optional CANtrak display.

Multi-Engine Systems

Figures 2-3 and 2-4 illustrate a twin-engine EPS system with single and dual control stations, respectively. A triple- or quad-engine EPS system will have the same general arrangement, with the addition of tiebar(s) to steer the additional engine(s).

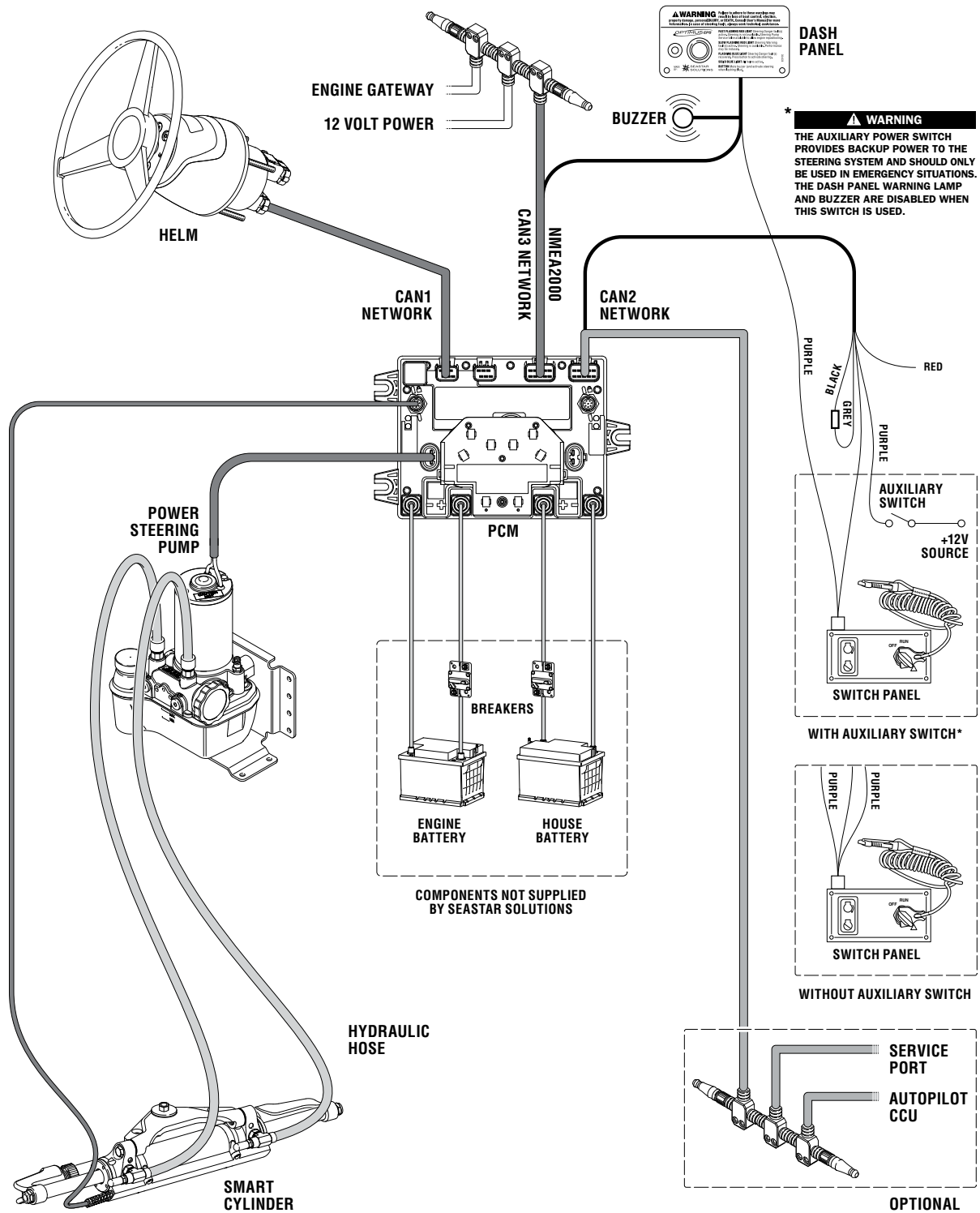


Figure 2-1. Optimus EPS system diagram, single station, single engine, with dash panel.

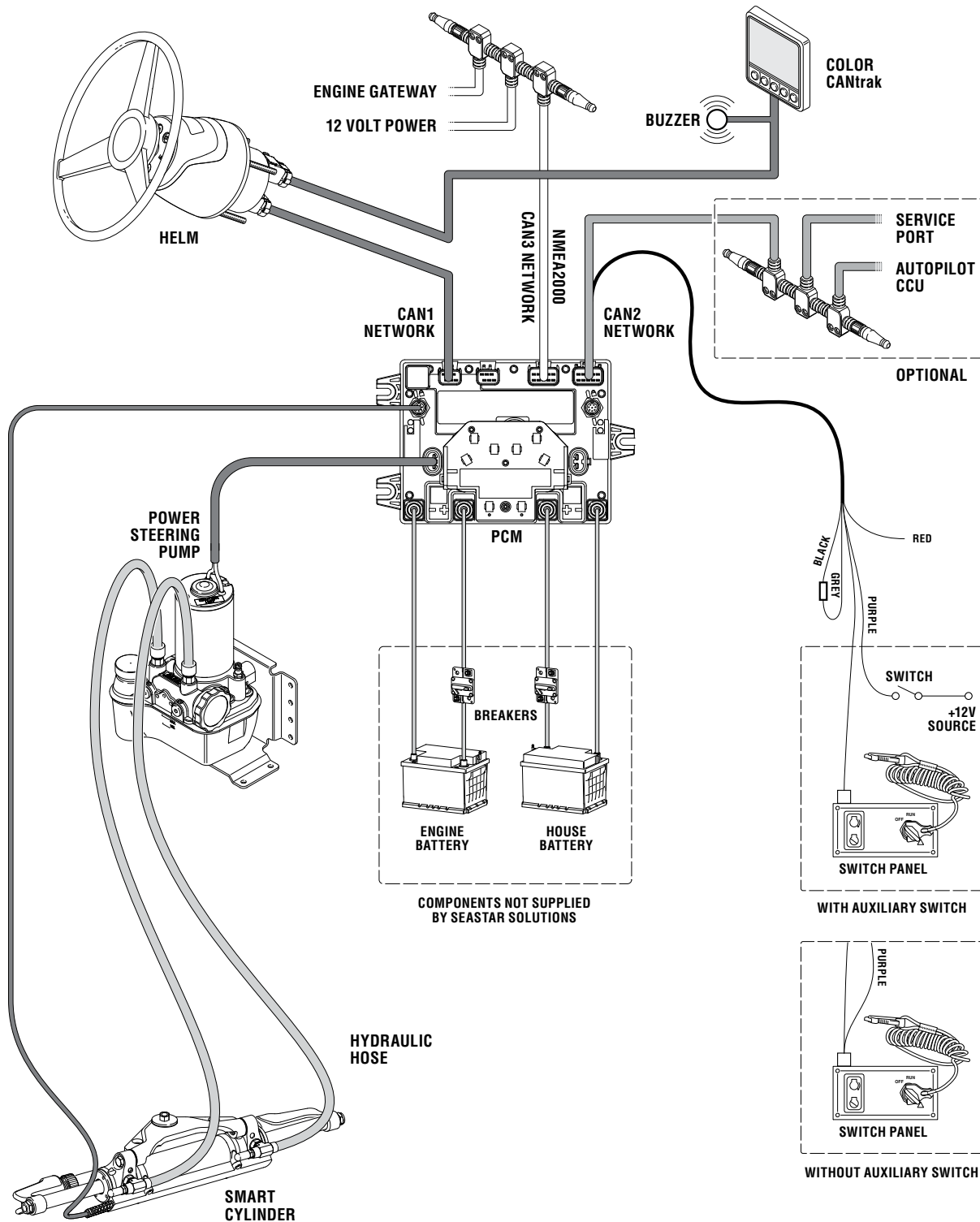


Figure 2-2. Optimus EPS system diagram, single station, single engine, with optional CANtrak.

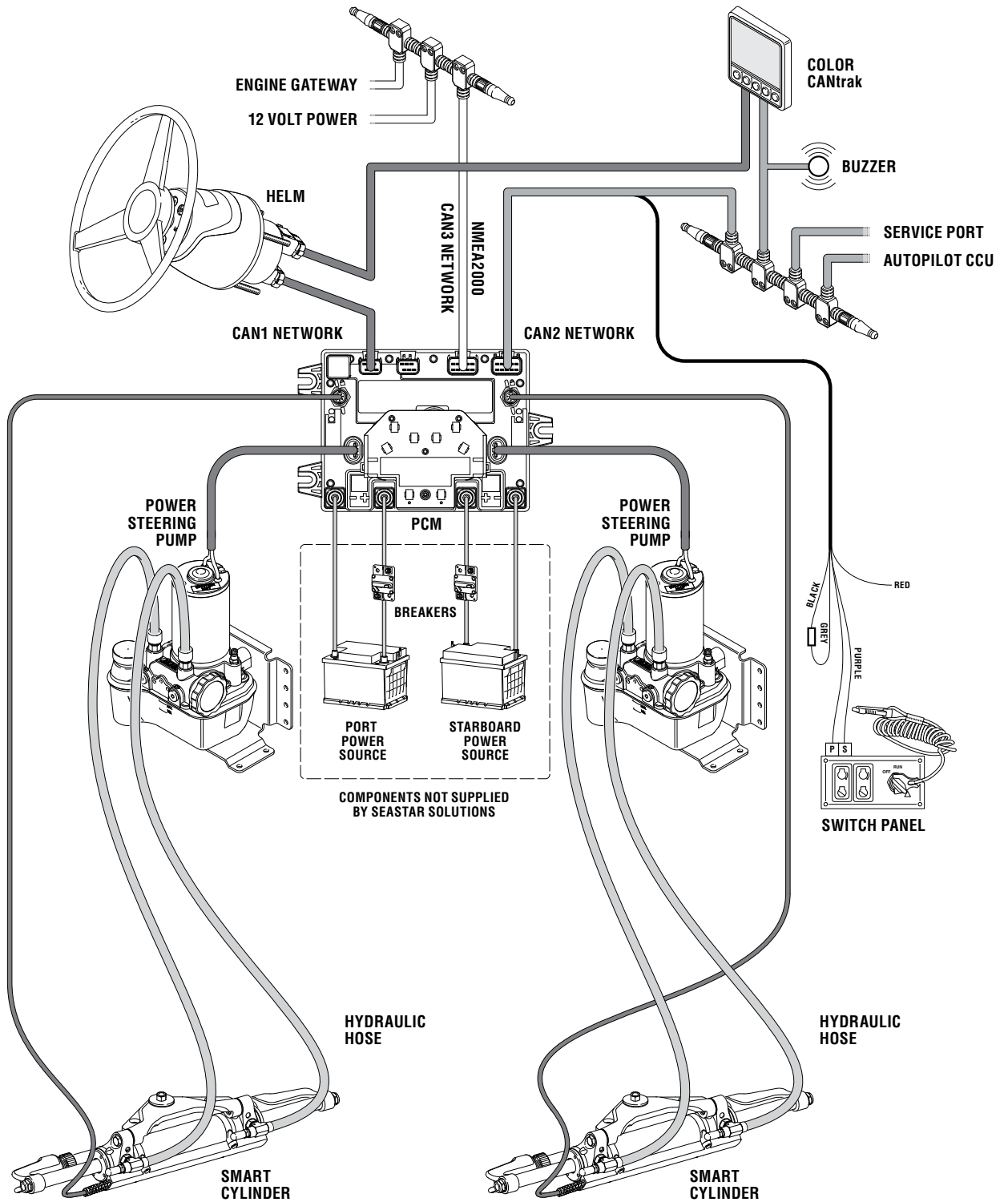


Figure 2-3. Optimus EPS system diagram, single station, twin engine.

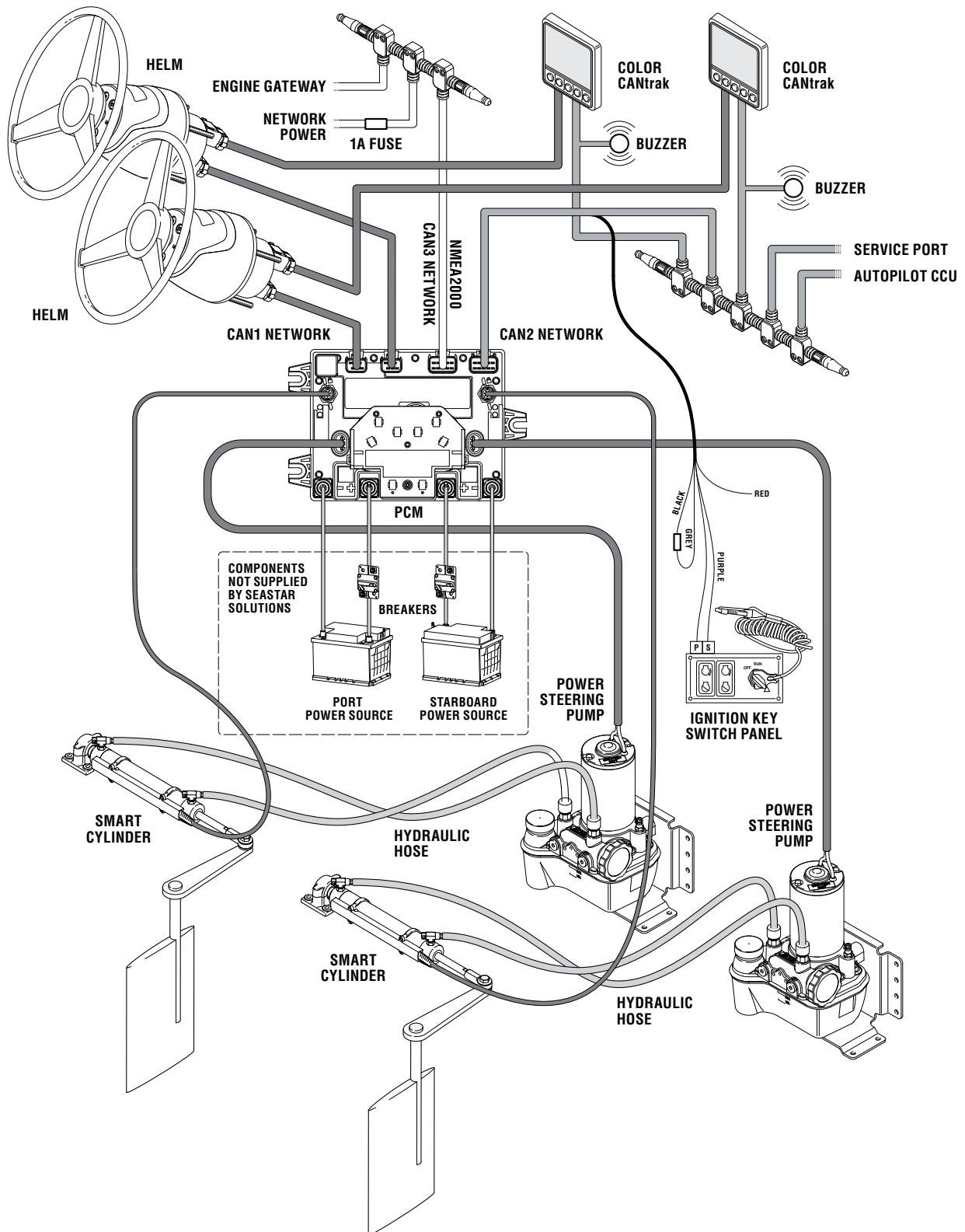


Figure 2-4. Optimus EPS system diagram, dual station, twin inboard.

3.0 FIRST TIME OPERATION

Before operating your boat for the first time after the installation of the Optimus EPS system, take the time to:

- Familiarize yourself with the location and function of the steering system components (section 3.1).
- Perform a system inspection (section 3.2).
- Check the SmartCylinder installation for interference and proper cable routing (section 3.3).

Once you've taken these steps and are comfortable with the function of the steering system, do a sea trial to get familiar with the steering response (section 3.4).

3.1 Locate the Following Steering System Components

3.1.1 Electronic Helm(s)

The steering wheel is attached to this unit, which may be located immediately under the wheel or just behind the dash panel. The images below show the available helm styles.

⚠ CAUTION

Keep magnets away from the helm. They may interfere with proper helm operation.



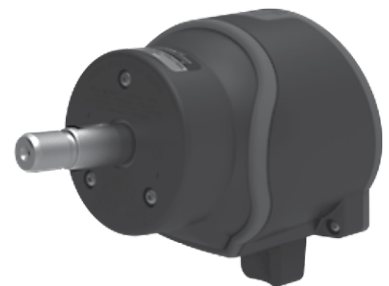
EPS Front Mount Helm



EPS Rear Mount Helm



EPS Classic Tilt Helm



EPS Sport Plus Tilt Helm

Figure 3-1. EPS Helm configurations.

3.1.2 Circuit Breakers for Optimus EPS System

These are supplied by the installer and may be mounted in a variety of locations. Check near the batteries, in the circuit breaker box, or near the PCM or hydraulic pumps. There should be a breaker for each PCM power feed.

3.1.3 Pump Control Module (PCM)

The PCM is located in a dry area and can usually be found inside the center console, in the area behind the dash, or in a compartment near the engines or batteries. The PCM is always located close to the steering pumps. There will be one PCM on most boats (except for some triple and quad engine configurations that use two PCMs).

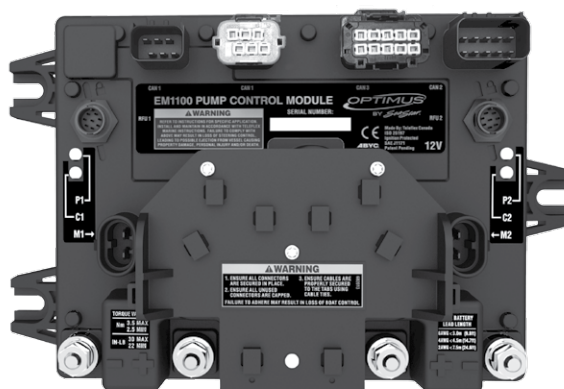


Figure 3-2. Pump control module.

3.1.4 Hydraulic Steering Pumps

The hydraulic steering pumps supply pressurized fluid to the SmartCylinders to steer the engines, and are located near the PCM. They can usually be found in a compartment near the engines, the center console, or behind the dash. There is one pump for each steering cylinder. The steering fluid reservoir is mounted directly to the pump; it is here that you will check the fluid level and add steering fluid as necessary.

Note: these pumps look similar to the trim pumps that tilt the engines. They can be distinguished by the integrated steering service valve.

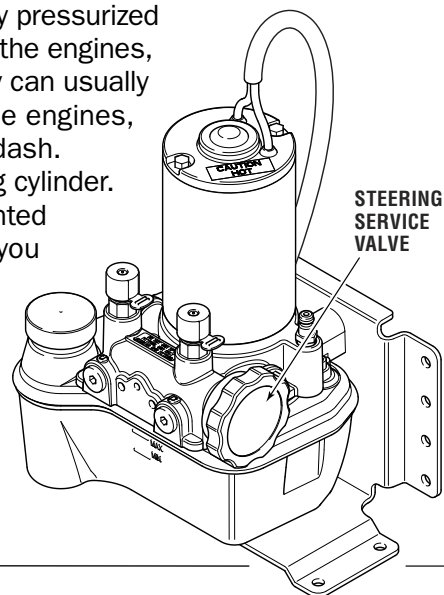


Figure 3-3. Hydraulic pump and reservoir.

3.1.5 SmartCylinders

Outboards: mounted to the engine tilt tube just below the engine cowling.

Sterndrives: located just inside the transom on the starboard side of the outdrive.

Inboards: usually located in a compartment below the aft deck.

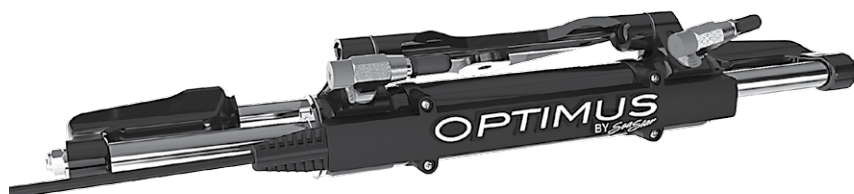


Figure 3-4. Outboard SmartCylinder with sensor.

3.1.6 Steering Service Valves

⚠ WARNING

WEAR A COAST GUARD-APPROVED PERSONAL FLOTATION DEVICE (PFD) WHEN MANUALLY REALIGNING ENGINES.

The steering service valves permit the bypass of the EPS system and allow the engines to be manually positioned. They should only be used in the event of an EPS system failure, in which case instructions will be given on the CANtrak (if so equipped).

The service valves are integrated into the power steering pumps. To open the valve, turn the knob fully counter-clockwise until it stops (about three turns). Turn the knob fully clockwise to close it. Turn just until you feel the valve contact the stop – do not use tools or over-tighten.

Some vessels may be fitted with remote service valves as shown in figure 3-5.



Figure 3-5 Remote steering service valve.

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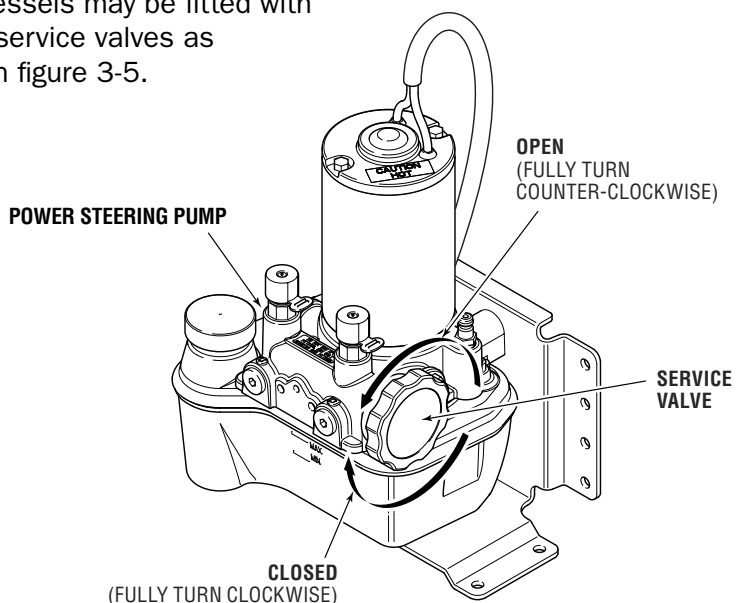


Figure 3-6. Service valve location.

Optimus Operations Manual, Rev. G

3.1.7 CANtrak Display

On all multi-engine systems (optional on single-engine systems) a color display at the main helm station shows system status and fault notifications. When enabled by the dealer or builder it can also be used to make adjustments to steering parameters. A CANtrak display may also be installed at additional helm stations.

The CANtrak display is supplied with a plastic cover to protect it from the weathering effects of sunlight. Remove and stow the cover before using the boat, and replace it when finished.



Figure 3-7. CANtrak Display.

3.1.8 Dash Panel (Single-Engine Outboard Vessels)

Single-engine outboard vessels may be equipped with a dash panel in place of the optional CANtrak display. System status and faults are indicated by a bi-color LED lamp and an audible buzzer. The button is used to mute alarms, re-activate steering after a recovered fault, and to cycle through five levels of brightness on the LED.

⚠ WARNING
DO NOT OPERATE THE VESSEL WITHOUT A FUNCTIONING CANTRAK DISPLAY OR DASH PANEL WARNING LAMP.



Figure 3-8 Dash panel.

3.2 Perform System Inspection

WARNING

FAILURE TO ADHERE TO THESE WARNINGS MAY RESULT IN LOSS OF BOAT CONTROL, LEADING TO POSSIBLE EJECTION FROM VESSEL, CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

WARNING

ON MULTIPLE HELM STATION BOATS ALL STEERING HELMS ARE ACTIVE WHEN THE OPTIMUS EPS IS TURNED ON. THIS IS THE SAME AS YOU WOULD FIND ON A CONVENTIONAL HYDRAULIC STEERING SYSTEM.

A system inspection should be performed before every use. For your convenience the inspection steps are summarized on the laminated Quick Reference Guide, which should remain on the vessel at all times. (Contact your dealer immediately if you do not have your QR Guide.)

To perform a system inspection, first start up the system by turning on the ignition switch. The steering will become active at all helms and the CANtrak display (if so equipped) will turn on. When the CANtrak is powered up it will display a Warning screen that prompts you to conduct the system inspection. Press the button labeled **Info** to enter a sequence of screens that will prompt you through the same system inspection procedure listed below and on your QR Guide.

Single-Engine Systems: Your boat may be equipped with a dash panel instead of a CANtrak display. When the system is switched on the red LED warning lamp will illuminate for 1/2 second before changing to a steady blue lamp, which indicates the system is ready to use. Verify that the red lamp illuminates on startup, as this is a key check of the fault notification system.

3.2.1 System Inspection Procedure

WARNING

FAILURE TO ADHERE TO THESE WARNINGS MAY RESULT IN LOSS OF BOAT CONTROL, LEADING TO POSSIBLE EJECTION FROM VESSEL, CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

1. Check steering fluid level in all steering pumps.

Each Optimus hydraulic pump has a steering fluid reservoir. Ensure the fluid level is between the MIN and MAX marks on the reservoir as shown in figure 3-9. Use only SeaStar EPS steering fluid (HA5482) in the Optimus EPS System.

2. Verify immediate steering response when turning steering wheel(s).

Turn the steering wheel slowly to port and to starboard and make sure the engines (or outdrives/rudders) follow the commands. Watch that the hoses and cables move freely without any snags or hang-ups.

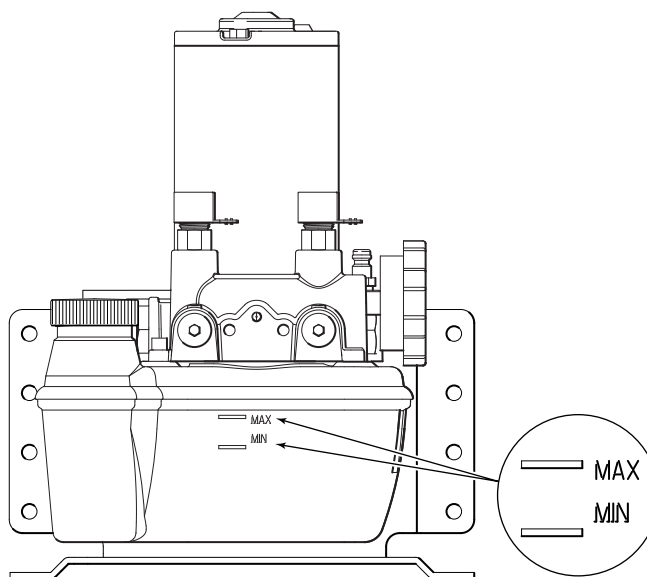


Figure 3-9. Location of fluid level marks.

⚠ WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

⚠ WARNING

DO NOT OPERATE THE VESSEL WITHOUT A FUNCTIONING CANTRAK DISPLAY OR DASH PANEL WARNING LAMP.

3. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.

Check all steering hoses and fittings between the pump, service valves and cylinders for any signs of leakage, kinking, wear or chafing. Check all electrical and mechanical cabling for abrasion, wear, rubbing or chafing. Check that all connections are tight and free of corrosion.

4. Check for binding, loose, worn or leaking steering or shift/throttle control components.

Check all shift and throttle cables for signs of wear, damage or chafing. Check that all linkages and cables move freely and are not binding or corroded.

5. Verify proper shift and throttle response for all control levers.

Check that all shift and throttle levers operate freely and cause the engines to shift accordingly. Put the engines in neutral idle mode and confirm that the throttle responds correctly and returns to idle.

6. Verify that no alarms or warnings are shown on the CANtrak display or dash panel.

If any warnings are found, follow the instructions on the CANtrak screen or refer to Section 6 before proceeding.

Read the System Inspection steps on the CANtrak display and acknowledge them by pressing the button labeled OK.

⚠ CAUTION

It is recommended the full system inspection procedure be reviewed on a regular basis to retain familiarity.

3.3 Installation Checks

To verify correct installation of the Optimus SmartCylinder, perform the following installation checks when the boat is delivered and after each boat servicing. You will need someone to assist you.

⚠ WARNING

FAILURE TO PERFORM THESE CHECKS MAY RESULT IN DAMAGE TO THE SMART-CYLINDER SENSOR AND AFFECT THE SAFE OPERATION OF THE BOAT'S STEERING.

1a. Outboard Interference Checks – Confirm that there is no interference between the steering cylinder(s), splashwell, outboard engine(s), tie bars, or any combination of these parts, by performing the steps below. For each step also check that the hoses and harnesses are moving freely with no rubbing or binding (see figure 3-10 and figure 3-11). Be sure to steer slowly while performing these checks.

- i) With the engine(s) fully tilted DOWN, turn the steering wheel from hard over to hard over and confirm that no interference occurs. Repeat with engine(s) fully tilted UP.

For multi-engine vessels only:

- ii) Trim the port engine(s) fully DOWN and the starboard engine(s) fully UP. Turn the steering wheel from hard over to hard over and confirm that no interference occurs. Repeat, reversing the trim position of the engines.
- iii) Ensure all combinations of trim/tilt and steering do not cause interference.

1b. Inboard and Sterndrive Interference Checks – Confirm that the steering cylinders move through the entire steering range with no interference. Check that hoses and harnesses move freely with no rubbing or binding.

⚠ WARNING

IF ANY ISSUES ARE FOUND DURING THE INSTALLATION CHECKS, IMMEDIATELY RETURN THE BOAT TO THE SERVICE DEALER FOR THOSE ISSUES TO BE REMEDIED.

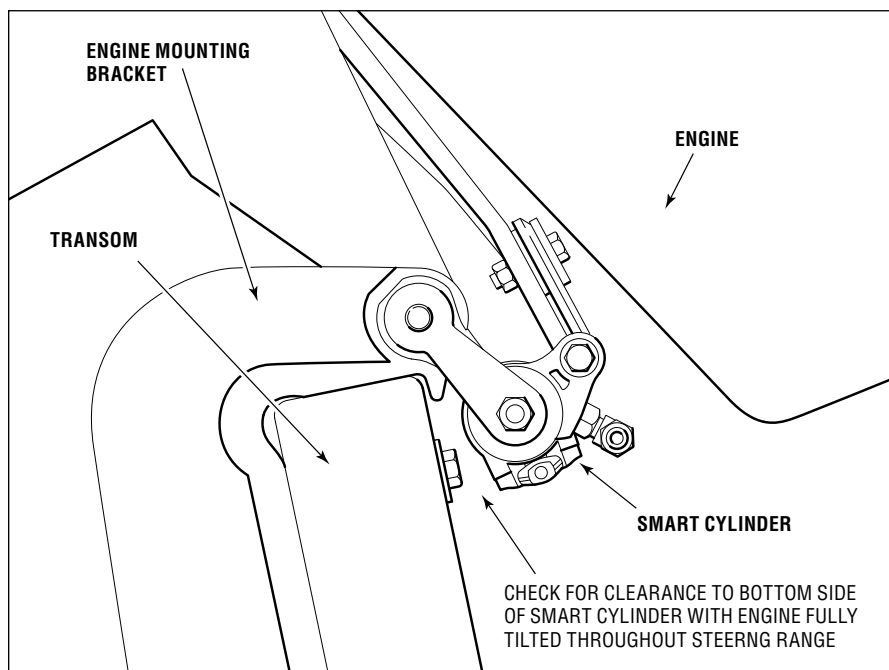


Figure 3-10. Engine side view when tilted.

2. Sensor cable – Confirm that the SmartCylinder Sensor Cable is tied securely to the hoses with gradual bends as shown figure 3-11.

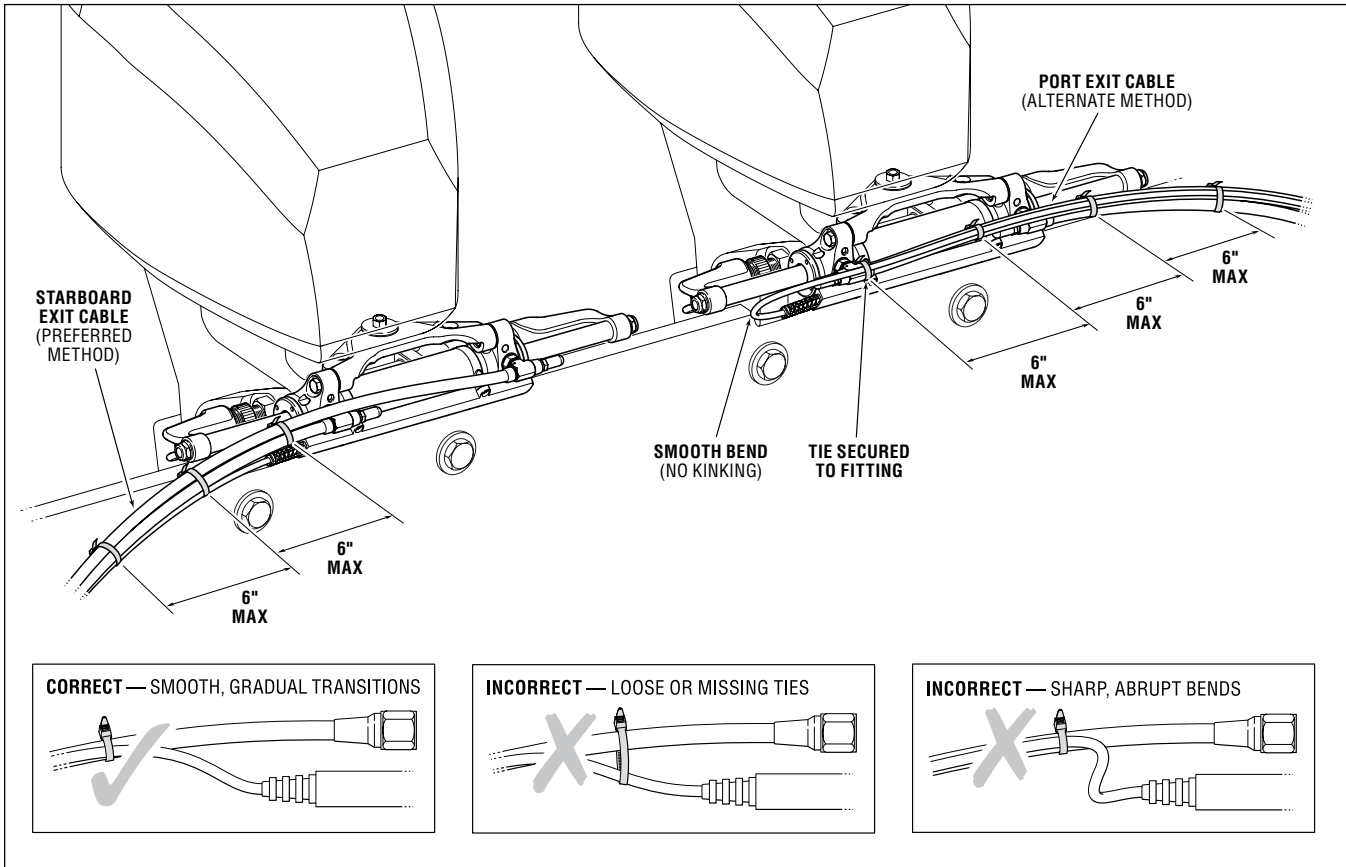


Figure 3-11. Sensor cable and hose routing checks.

3.4 Initial Sea Trial

With the engine lanyard properly connected to you, and any passengers securely seated, carefully proceed to a section of deep, open water at a slow to moderate speed. Use the trip to get a feel for the steering response. When in open water that is deep enough to assure you will not run aground, try various maneuvers with the boat at various speeds until you are comfortable operating the boat. Be sure to spend some time backing up at a slow speed. Once familiar with the operation run the boat in a safe, normal fashion and enjoy your electronic power steering. If adjustments to the system are required, see Section 5.0 for steering adjustments or contact your dealer.

CAUTION

Keep magnets away from the helm. They may interfere with proper helm operation.

4.0 SYSTEM USE

If this is the first-time use, or for more details, see Section 3 of this manual.

4.1 Before Each Use

Prior to every use perform a system inspection as outlined here. See section 3.2 for further details.

1. Remove steering lock clips (see Appendix B) if they have been installed for trailering or storage (outboards only).
2. Check steering fluid level in all steering pumps.
3. Verify immediate steering response when turning steering wheel(s).
4. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.
5. Check for binding, loose, worn or leaking steering or shift/throttle control components.
6. Verify proper shift and throttle response for all control levers.
7. Verify that no alarms or warnings are shown on the CANtrak display.

WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

WARNING

DO NOT OPERATE THE VESSEL WITHOUT A FUNCTIONING CANTRAK DISPLAY OR DASH PANEL WARNING LAMP.

4.2 Multiple Station Boats

WARNING

NEVER ATTEMPT TO MOVE FROM ONE HELM STATION TO ANOTHER WHILE THE VESSEL IS UNDER WAY. ALWAYS PLACE ENGINES IN NEUTRAL AND ENSURE THE BOAT IS STATIONARY BEFORE MOVING TO ANOTHER STATION.

CAUTION

On multiple helm station boats all helms are active when the Optimus EPS is turned on.

The Optimus EPS system is designed to operate much like a conventional hydraulic steering system. The boat can be steered from any helm without requiring additional steps to transfer control.

Like a conventional hydraulic system, steering input from each helm is added cumulatively, which means it is possible that steering inputs from a second helm can cancel out or exaggerate the operator's inputs. It is important that all passengers, and especially children, are instructed not to touch the helms unless specifically requested to take control.

4.3 Autopilot Operation

⚠ WARNING

ALWAYS READ AND UNDERSTAND THE AUTOPILOT OPERATION INSTRUCTIONS COMPLETELY BEFORE ENGAGING THE AUTOPILOT MODE. NEVER LEAVE THE HELM STATION UNATTENDED WHEN THE AUTOPILOT IS ENGAGED.

The Optimus EPS steering system is designed to interface with many autopilot controllers. See your Autopilot's documentation for specific model compatibility.

The steering effort may be noticeably higher when the autopilot is engaged. This resistance may be user adjustable; see Section 5.1.4 of this manual.

When any wheel is turned with the autopilot engaged, the helm will take control of the system and manually override the autopilot. The steering resistance will return to normal until the autopilot re-engages. See your autopilot user's manuals for specific system behavior.

When autopilot is engaged on systems equipped with a CANtrak display the run screen will display a notification as shown in figure 4-1. On single-engine systems with a dash panel the only notification will be on the autopilot unit itself.

The Title Bar will display "Autopilot Mode" when the autopilot is engaged.



Figure 4-1. Autopilot mode screen.

4.4 High Speed Rudder Limit

The boat builder or dealer may have set a high speed rudder limit in order to keep the vessel in a comfortable operating envelope and prevent aggressive maneuvers at high speed. If this is the case you will find that your steering angle is progressively limited as boat speed increases. See section 5.1.5 for more information on speed sensitive steering and how it works.

5.0 OPERATOR INTERFACE

5.1 CANtrak Display

The Optimus CANtrak display has an easy to navigate menu system, adjustable backlighting for night use and includes a cover to protect it from the sun when not in use. The display is standard equipment on all multi-engine systems and optional equipment on single-engine systems.



Figure 5-1. CANtrak display, All Helms Active screen.

The CANtrak display serves these purposes:

- 1.** Displays the current system operating conditions.
- 2.** Handles system faults:
 - a) Displays system warnings in case of a system fault.
 - b) Sounds an audible alarm in case of a system fault.
 - c) Instructs the operator what to do in case of a system fault.
- 3.** Permits changes to the basic system settings.
- 4.** Provides system and diagnostic information

5.1.1 CANtrak Display Navigation

The five buttons at the bottom of the unit are used to select various actions. The five boxes at the bottom of the display screen indicate the legend for each button. These legends vary based on what is on the screen.

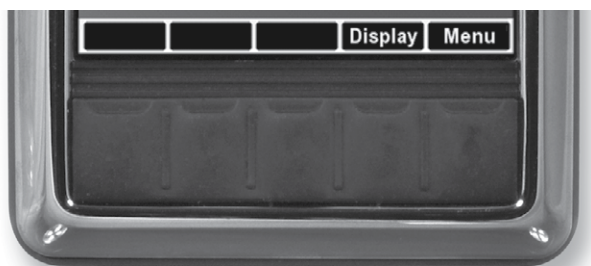






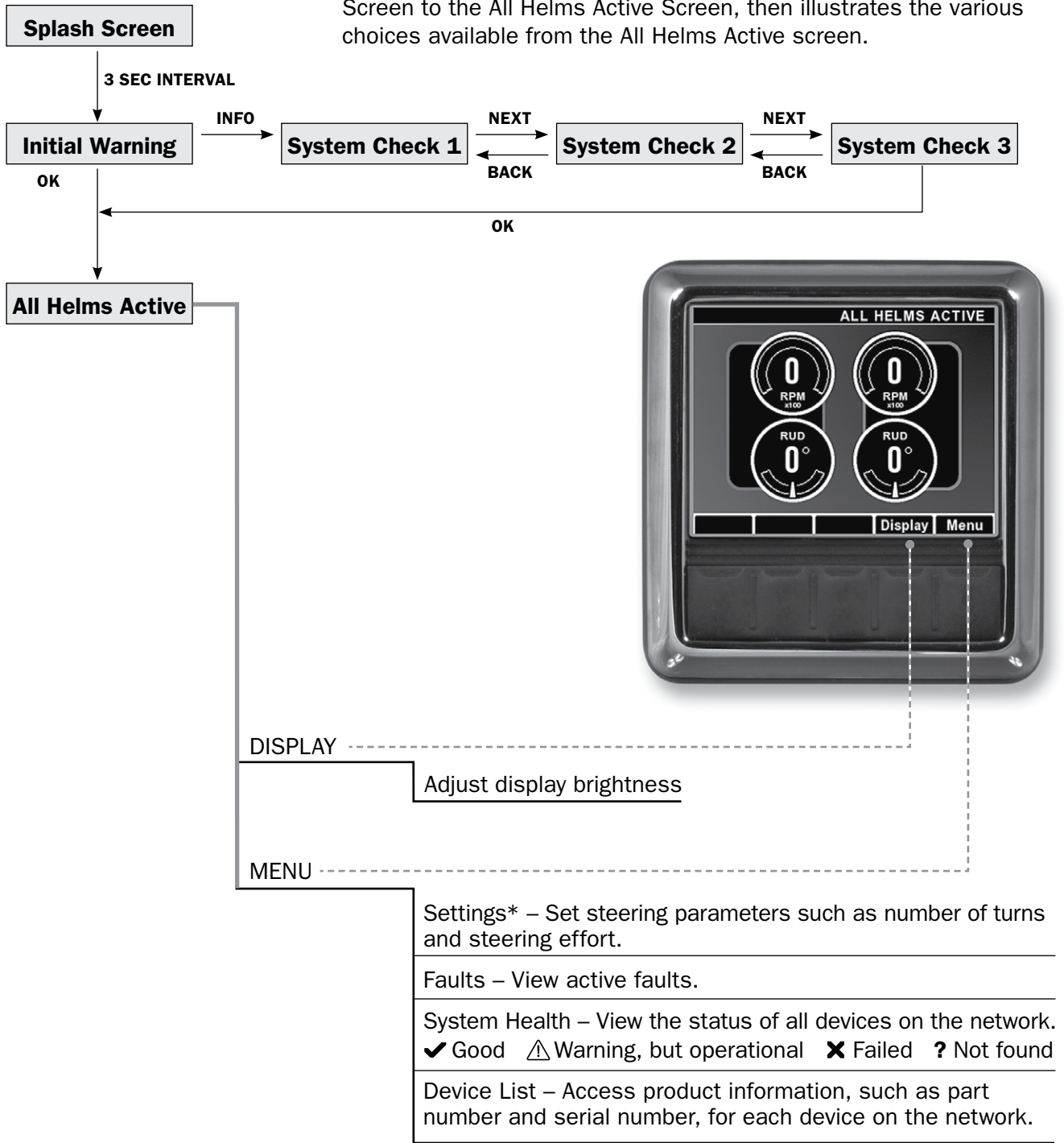


Figure 5-2. Navigation buttons and legend.

WORD OR SYMBOL	IDENTIFIES A FUNCTION OR SETTING
	Moves the cursor up the screen to the next item.
	Moves the cursor down the screen to the next item.
	Enters the sub-menu at the cursor location.
	Reduces the setting of the selected item.
	Increases the setting of the selected item.
OK	Accepts a given statement or condition and advances to the next screen.
	Returns to previous menu.
Save	Saves change and returns to previous menu.

5.1.2 CANtrak Display Map – All Helms Active (Normal Steering Mode)

The following diagram shows the progression from the Splash Screen to the All Helms Active Screen, then illustrates the various choices available from the All Helms Active screen.



* Menu may be deactivated. Contact your dealer.

Figure 5-3. CANtrak display map.

5.1.3 All Helms Active Screen

The All Helms Active screen (also called the Run screen) will be displayed under normal operating conditions after the startup warning has been acknowledged. The screen shows engine RPM, rudder angle, and legends for the Display and Menu buttons.

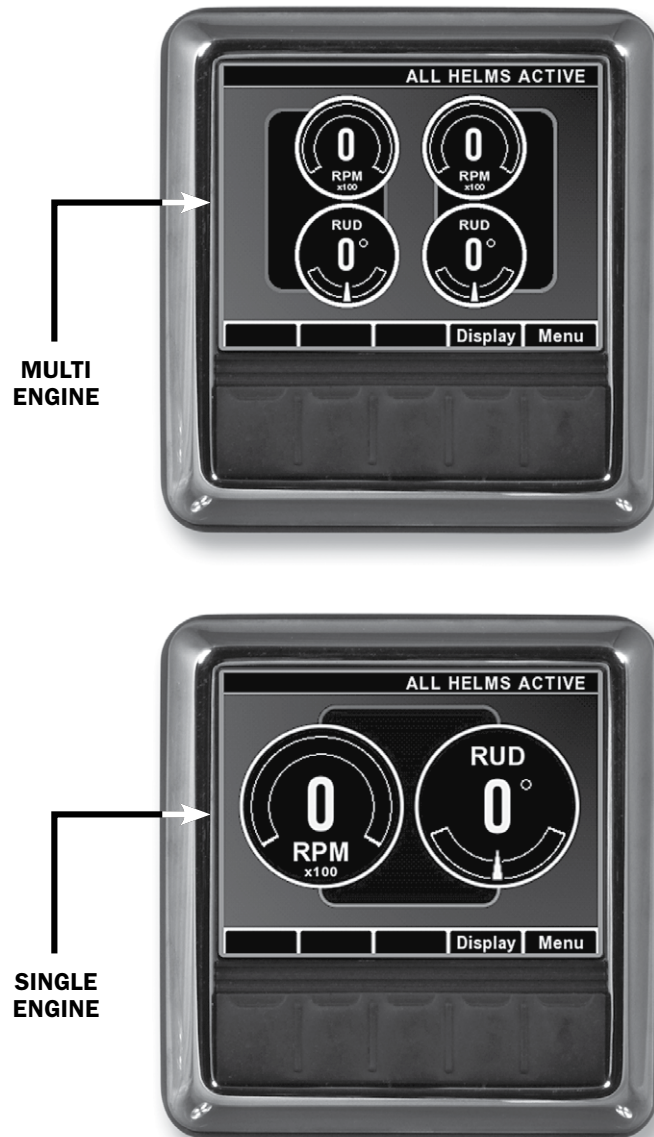


Figure 5-4. All Helms Active screens.

5.1.4 Settings Screen [Steering]*

If the boat builder (or dealer) has enabled this menu option, the Steering Settings screen allows adjustment of steering effort and helm turns. To get to the screen, select Settings from the Menu, then select Steering. You will be prompted to save changes when you exit.

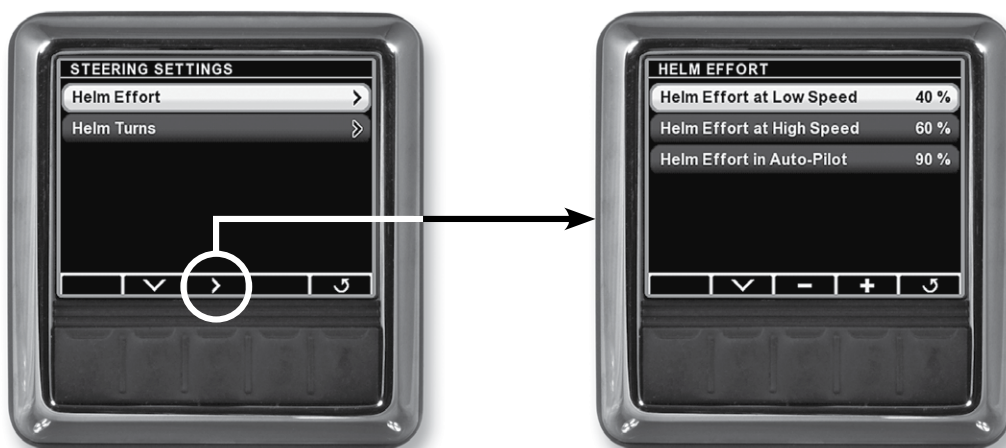


Figure 5-5. Steering Settings .

⚠ CAUTION

Adjusting steering effort or steering turns can significantly impact boat handling. Proceed with caution after making any changes.

Helm Turns at Low Speed

Sets the number of turns (hard-over to hard-over) when the vessel is running at low speeds. The range is 3.5 to 8 Turns.

Helm Turns at High Speed

Sets the number of turns (hard-over to hard-over) when the vessel is running at high speeds. The range is 3.5 to 8 Turns.

Helm Effort at Low Speed

Sets the steering resistance when the vessel is running at low speeds. It is adjustable between 1 and 100.

Helm Effort at High Speed

Sets the steering resistance when the vessel is running at high speeds. It is adjustable between 1 and 100.

Helm Effort in Auto-Pilot

Sets the steering resistance when autopilot is engaged. To prevent accidental course corrections with the wheel this should be set slightly higher than the high speed effort. It is adjustable between 1 and 100.

** May not be available on all installations. Contact your builder or dealer.*

5.1.5 Speed Sensitive Steering

A key advantage of Optimus electronic power steering is the ability to change steering parameters as boat speed changes. Both the steering effort and helm turns are smoothly adjusted between their low and high speed settings as the boat speed changes. Figure 5-6 illustrates how this works.

Low and high boat speed is defined by engine RPM using values determined by the boat builder or the dealer that installed the system. These are not user adjustable.

⚠ CAUTION

Adjusting steering effort or steering turns can significantly impact boat handling. Proceed with caution after making any changes.

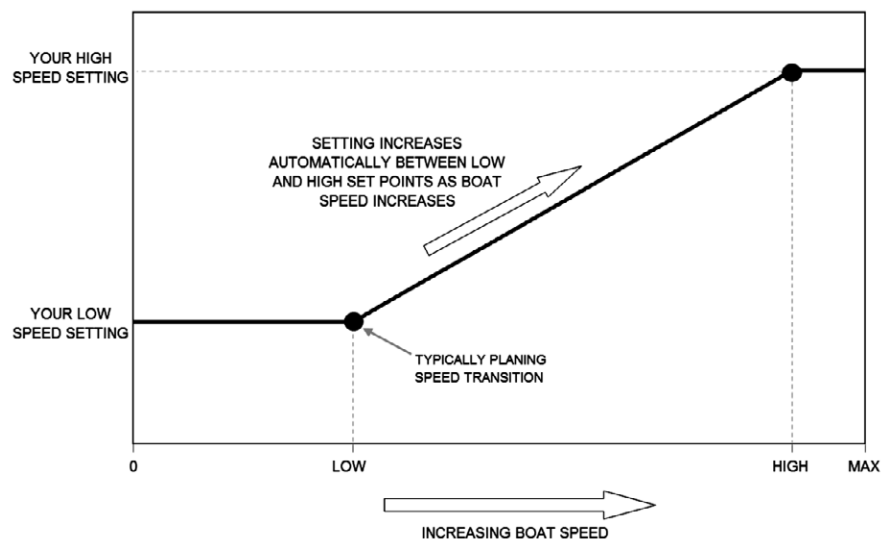


Figure 5-6. Change of helm settings with speed.

High Speed Rudder Limit

The boat builder or dealer may have set a high speed rudder limit in order to keep the vessel in a comfortable operating envelope and prevent aggressive maneuvers at high speed. If this is the case you will find that your steering angle is progressively limited as boat speed increases.

5.2 Dash Panel

The Optimus EPS Dash Panel is a simplified system interface for single-engine EPS systems. It consists of a bi-color LED indicator lamp, a multi-function pushbutton, and an audible buzzer.

Any reference to “dash panel” in this manual is referring to this interface.

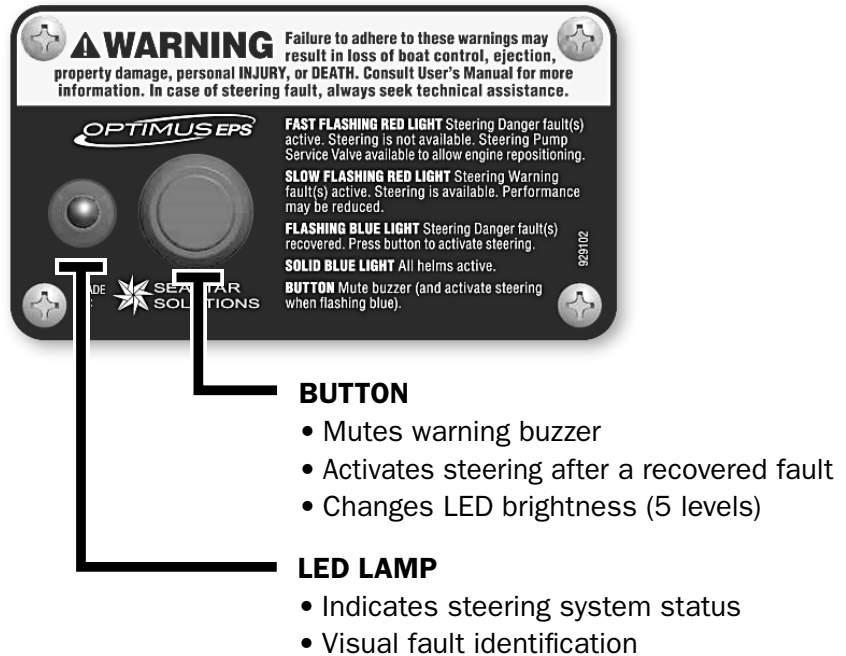


Figure 5-7. Dash panel.

5.2.1 System Status Indication

LEGEND	
SYMBOL	IDENTIFIES A FUNCTION OR SETTING
	LED is off.
	LED is steady on.
	LED is flashing at indicated speed.
	Cycles LED brightness through five levels.
	Buzzer is off.
	Buzzer is on.
	Mute buzzer.

SYSTEM STATUS	BLUE LED	RED LED	BUZZER	BUTTON FUNCTION
Steering active with no faults.				
Danger fault active.		FAST		
Warning fault active.		SLOW		
Danger fault has been cleared. Press button to re-activate steering.	SLOW		 (2 beeps only)	Activates Steering
Warning fault has been cleared.			 (2 beeps only)	

5.2.2 System Auxiliary Power

Your system may be wired such that the steering system turns on with either the engine ignition or an auxiliary switch on the dash (see figure 2-1). The auxiliary power switch is intended to provide backup power to the steering system and should only be used in emergency situations. The dash panel warning lamp and buzzer are disabled when this switch is used.

WARNING

THE AUXILIARY POWER SWITCH IS PROVIDES BACKUP POWER TO THE STEERING SYSTEM AND SHOULD ONLY BE USED IN EMERGENCY SITUATIONS. THE DASH PANEL WARNING LAMP AND BUZZER ARE DISABLED WHEN THIS SWITCH IS USED.

5.2.3 Steering Settings

The dash panel has no provision for user adjustment of steering settings, but your steering system is still equipped with speed sensitive settings for steering effort and helm turns. It is worth reviewing section 5.1.4 and 5.1.5 to gain an understanding of the speed sensitive settings and how they function.

6.0 SYSTEM FAULTS & HAZARDS

Should a steering fault occur it will be communicated through the CANtrak display or, on some single-engine systems, through a dash panel warning lamp. This section defines the three types of hazards you may experience and how the system will handle each.

NOTICE

When a serious fault occurs, consider your options. While the system has many features to allow the boat to return to port in a slow and safe manner, local conditions or operator skills may dictate that calling for assistance is the prudent thing to do.

Note that in this section all references to “engine” may be interpreted to refer to outdrive or rudder in sterndrive and inboard boats.

6.1 Hazard Definitions

6.1.1 Danger

A danger fault is a critical system fault which will result in limited or no steering performance and requires immediate action.

Depending on the nature of the fault, steering will either be restricted to one engine or suspended completely. The engines may need to be manually realigned and the vessel steered using the shift and throttle.

6.1.2 Warning

A warning fault is a non-critical system fault which may cause the steering speed to be reduced.

Although a warning fault may not always adversely affect steering performance it is an indication of a problem in the system and should be remedied.

6.1.3 Caution

A caution fault is a non-critical system fault that will have no effect on system performance. Although a caution fault will not adversely affect steering it is an indication of a problem in the system and should be corrected as soon as possible. The yellow warning triangle will remain on the CANtrak display screen until a technician has remedied the issue.

Caution faults are not applicable on single-engine systems with the dash panel interface.

6.2 System Fault Handling – CANtrak

In case of a Danger or Warning message, the CANtrak display (if so equipped) will advise the operator how to proceed. The following sections describe what to expect in case of either fault.

6.2.1 Danger Fault Handling

A danger fault is a critical system fault which will result in limited or no steering performance and requires immediate action.

During a danger fault, the CANtrak display will display DANGER across the top, sound a continuous buzzer (until muted) and display fault information and handling in three zones. See figure 6-1.

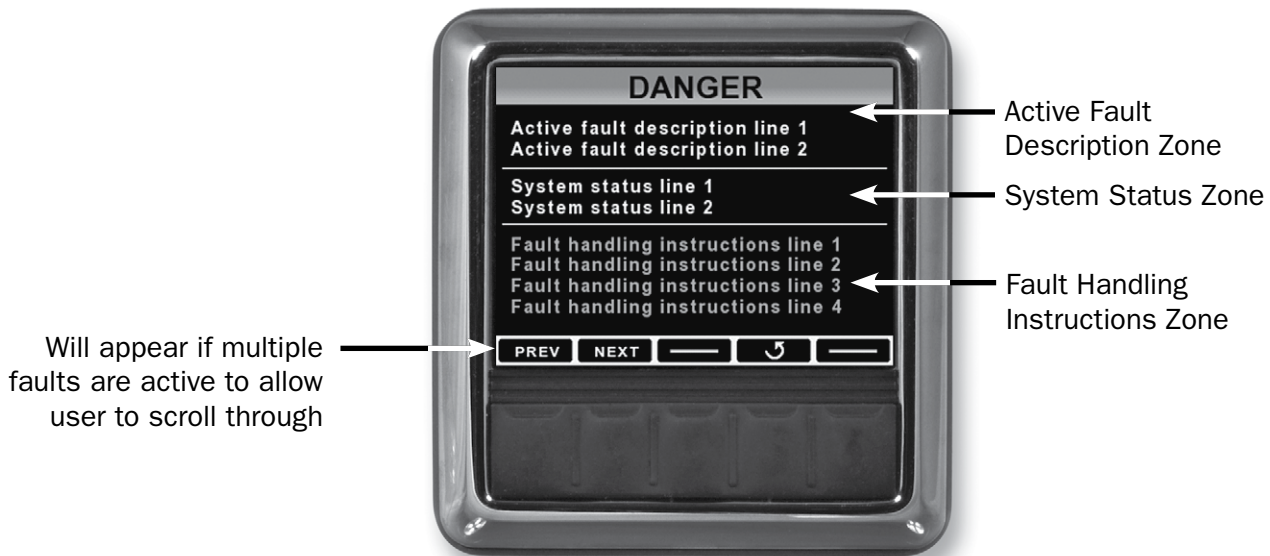


Figure 6-1. Danger fault screen layout.

Active Fault Description Zone

Provides details specific to the system fault. These will include a brief description of the fault and are primarily for troubleshooting purposes.

System Status Zone

Displays information about the status of the system and if the system has automatically reacted to the fault.

Fault Handling Instructions Zone

Provides detailed instructions on how to proceed. In the case of a danger fault, this will instruct the operator what to do and how to proceed should Limp Home mode be required.

6.2.2 Limp Home

When a Danger fault results in steering performance being restricted or suspended, the CANtrak may provide instructions on how to enter Limp Home mode.

Limp Home will provide instructions for the user to manually move the engine(s) and allow the user to “limp home” with reduced performance. If you aren’t familiar with the service valve location and operation, see section 3.1.6 for information.

There are two Limp Home modes depending on the nature of the fault.

WARNING

LIMP HOME MODE IS AN OVERRIDE SYSTEM. IT MAY SEVERELY LIMIT YOUR BOAT CONTROL. IT SHOULD ONLY BE USED IN AN EMERGENCY IF YOU ARE UNABLE TO CALL FOR ASSISTANCE. PROCEED WITH EXTREME CAUTION. ALWAYS WEAR PFDs AND LANYARD. REFER TO THE NOTICE IN SECTION 6.0.

Limp Home Mode 1

This mode occurs when the system can no longer provide steering to ANY of the engines. The CANtrak will instruct the operator to manually center the engines using the service valves, then proceed to port immediately using the shift and throttle controls to steer the vessel.

The Limp Home text will be slightly different in a single engine application.



Figure 6-2. Limp home instructions, all steering disabled.

6.2.2 Limp Home continued

Limp Home Mode 2

This mode occurs when one of the steering cylinders is not functional. This means that one engine (or two in a triple or quad system) cannot be steered. The CANtrak will instruct the operator to realign the non-responsive engine(s), tilt it out of the water and proceed to port immediately using the responsive engine(s).



Figure 6-3. Limp home instructions, no steering on one engine.

6.2.3 Warning Fault Handling

A warning is a non-critical system fault which will either maintain full steering system operation or cause the steering speed to be reduced.

During a warning fault, the CANtrak will display the same information as with a danger fault but WARNING will appear across the top of the screen and the buzzer will sound intermittently (until muted).

The operator may choose to exit the Warning screen and return to the All Helms Active screen by pressing the exit button, in which case the system will flash a warning icon on the run screen as shown in figure 6-4. This icon will remain in place until the fault is repaired. If the system recovers from the fault, for example if a battery runs low and is subsequently charged, the warning screen will disappear and the system will automatically resume normal operation.

Although the system may still operate normally under many warning faults, the vessel should still be returned to port and serviced immediately.



Figure 6-4. Run screen with system warning.

Some system faults may result in a reduced steering response warning. This means that the system will continue to steer normally but may respond more slowly to steering inputs.

In rare cases there may be multiple Warning faults at the same time. You can view a list of all active faults by selecting Faults from the display menu.

6.2.4 System Fault Handling – Example

The following is an example of how the system would respond to the warning fault hazard of a communication loss.

The CANtrak display will enter the warning screen mode and pulse the system warning buzzer. The three warning screen zones will appear as shown below.



Figure 6-5. Sample warning fault.

6.2.5 CANtrak Loss of Display

If CANtrak display operation is lost proceed as follows:

1. On a multiple helm station vessel each station may be equipped with a CANtrak display. If so equipped, navigate from another helm station and return to port for service.
2. If there are no secondary displays on board, carefully verify (at low speed) that the steering system operates normally then immediately and cautiously proceed to port for service.
3. If both steering response and CANtrak display are lost, you are unable to obtain assistance, and you are in an emergency situation, proceed as follows:

WARNING





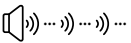

LIMP HOME MODE IS AN OVERRIDE SYSTEM. IT MAY SEVERELY LIMIT YOUR BOAT CONTROL. IT SHOULD ONLY BE USED IN AN EMERGENCY IF YOU ARE UNABLE TO CALL FOR ASSISTANCE. PROCEED WITH EXTREME CAUTION. ALWAYS WEAR A PERSONAL FLOTATION DEVICE (PFD) AND LANYARD.

Limp Home Mode 1 – No steering is available			
Multiple Outboard or Sterndrive Engines	Multiple Inboard Steering Cylinders	Single Outboard or Sterndrive Engine	Single Inboard Steering Cylinder
Steering is disabled. 1. Put all engines in neutral. 2. Open steering service valves. 3. Center all engines or outdrives. 4. Close steering service valves. 5. Return to port using throttles to steer.	Steering is disabled. 1. Put all engines in neutral. 2. Open steering service valves. 3. Center the rudders. 4. Close steering service valves. 5. Return to port using throttles to steer.	Steering is disabled. 1. Put engine in neutral 2. Open steering service valve. 3. Center the engine or outdrive. 4. Close steering service valve. 5. Return to port. 6. Seek assistance when possible.	Steering is disabled. 1. Put engine(s) in neutral. 2. Open steering service valve. 3. Center the rudder. 4. Close steering service valve. 5. Return to port. In a multi-engine vessel use throttles to steer. 6. Seek assistance when possible.
Limp Home Mode 2 – One of two steering cylinders is disabled			
Multiple Outboard or Sterndrive Engines	Multiple Inboard Steering Cylinders		
Affected engine steering disabled. 1. Put all engines in neutral. 2. Open steering service valves. 3. Turn affected engine(s) or outdrive fully away from other. 4. Close steering service valves. 5. Fully tilt affected engine(s) or outdrive. 6. Return to port on one engine.	Affected rudder steering disabled. 1. Put all engines in neutral. 2. Open steering service valve of affected rudder. 3. Center the affected rudder. 4. Close service valve of affected rudder. 5. Return to port on other rudder.		

Table 6-1. Limp home modes and instructions.

6.3 Fault Handling – Dash Panel

Faults are indicated on the dash panel with a flashing red LED warning lamp and an audible buzzer. The buzzer will sound until muted with the button.

FAULT TYPE	RED LED	BUZZER	BUTTON FUNCTION
Danger	 FAST		
Warning	 SLOW		

6.3.1 Danger Fault Handling

A danger fault is a critical system fault which will result in limited or no steering performance and requires immediate action. A danger fault is indicated with a fast flashing red lamp on the dash panel and a continuous buzzer. Press the button to mute the buzzer. The buzzer will sound again if additional faults become active.

In the event of a danger fault, call for assistance. In case of emergency, or when assistance is unavailable, you may need to limp home. Follow the Limp Home Mode 1 instructions for single-engine vessels in section 6.2.5.

WARNING

LIMP HOME MODE IS AN OVERRIDE SYSTEM. IT MAY SEVERELY LIMIT YOUR BOAT CONTROL. IT SHOULD ONLY BE USED IN AN EMERGENCY IF YOU ARE UNABLE TO CALL FOR ASSISTANCE. PROCEED WITH EXTREME CAUTION. ALWAYS WEAR A PERSONAL FLOTATION DEVICE (PFD) AND LANYARD.

6.3.2 Warning Fault Handling

A warning fault is indicated by a slow flashing red lamp and an intermittent buzzer. Press the button to mute the buzzer. The buzzer will sound again if additional faults become active.

In the event of a warning fault proceed to port and seek technical support. The steering system will continue to function in the event of a warning fault, but the performance may be altered. Depending on the nature of the fault, a warning fault can potentially turn into a danger fault with complete loss of steering function.

6.3.3 Danger Fault Clearing

If a danger fault is cleared the buzzer will beep twice and the blue lamp will flash slowly. You must press the button on the dash panel to re-activate the steering.

6.4 Buzzer

The buzzer is used to indicate a system fault. There are two different signals:

- 1.** Continuously on. This indicates a danger fault. A danger fault is a critical system fault which will result in limited or no steering performance and requires immediate action. See Section 6.2.1 (CANtrak) or 6.3.1 (dash panel).
- 2.** Alternating on and off. This indicates a warning fault. A warning fault is a non-critical system fault which may cause the steering speed to be reduced. See Section 6.2.3 (CANtrak) or 6.3.2 (dash panel).

All signals require immediate attention.

The buzzer may be silenced by pressing **Mute** on the CANtrak display (if so equipped) or by pressing the button on the dash panel.

6.5 Reduced Performance

Under certain fault conditions the steering response may slow down or require additional turns lock-to-lock. A typical cause might be a very low battery or failed rudder feedback sensor (single-engine systems only). When this happens the CANtrak (if so equipped) will advise the operator of the condition, indicate the reason, and supply instructions.

WARNING

PROCEED WITH CAUTION UNTIL THE FAULT IS CORRECTED AND NORMAL STEERING OPERATION RETURNS.

6.6 Steering Fluid Loss

In an emergency condition, and if SeaStar EPS steering fluid is not available, the following fluids may be used for a short period of time:

- SeaStar steering fluid
- Automatic transmission fluid
- Motor oil

If any of the above are used then the system should be flushed and refilled with SeaStar EPS steering fluid when the boat is returned to port.

In the event of an extreme emergency, any non-toxic, non-flammable fluid may provide temporary steering.

WARNING

NEVER USE BRAKE FLUID IN THE STEERING SYSTEM.

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7.0 MAINTENANCE AND REPLACEMENT PARTS

Following the routine maintenance schedules outlined below will ensure years of service from your Optimus Electronic Steering System, as well as keep you and your passengers safe from the dangers that are present on and off the water.

7.1 Owner(s) (End Users)

Prior to every use (see Section 3.2 for further details):

1. Check steering fluid level in all steering pumps.
2. Verify immediate steering response when turning steering wheel(s).
3. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.
4. Check for binding, loose, worn or leaking steering or shift/throttle control components.
5. Verify proper shift and throttle response at all control levers.
6. Verify that no alarms or warnings are shown on the CANtrak display.

WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

After every use:

1. Rinse the SmartCylinders with clean, fresh water and replace the CANtrak sun cover.

DO NOT rinse the PCM or the pumps.

7.2 Qualified Marine Mechanic

After the first 20 hours, then every 100 hours or 6 months thereafter (whichever comes first).

1. All points noted above.
2. Check tightness of ALL fasteners/fittings throughout the steering system. Tighten to correct torque specifications as required.
3. Check for mechanical play or slop throughout steering system, correct as required.
4. Check for signs of corrosion. If corrosion is present contact your dealer or SeaStar Solutions.
5. Check all electrical cables for chafing and wear.

After the first 200 hours or 12 months thereafter (whichever comes first).

1. All points noted above.
2. Remove support rod from engine steering/tilt tube. Clean engine steering/tilt tube and re-grease using a good quality marine grease.
3. Grease support rod liberally.

4. Grease all contact points shown in the figure below. DO NOT remove the tiller bolt to re-grease.
5. Remove the steering wheel(s) and re-grease the wheel shaft(s) using a good quality marine grease.
6. Inspect hydraulic oil for cleanliness; flush if required.
7. Check that the service valve is free to move and in the closed position.

WARNING

ANY WORK BEING PERFORMED WITH THE STEERING SYSTEM MUST BE COMPLETED BY A QUALIFIED MECHANIC WITH A WORKING KNOWLEDGE OF THE SYSTEM.

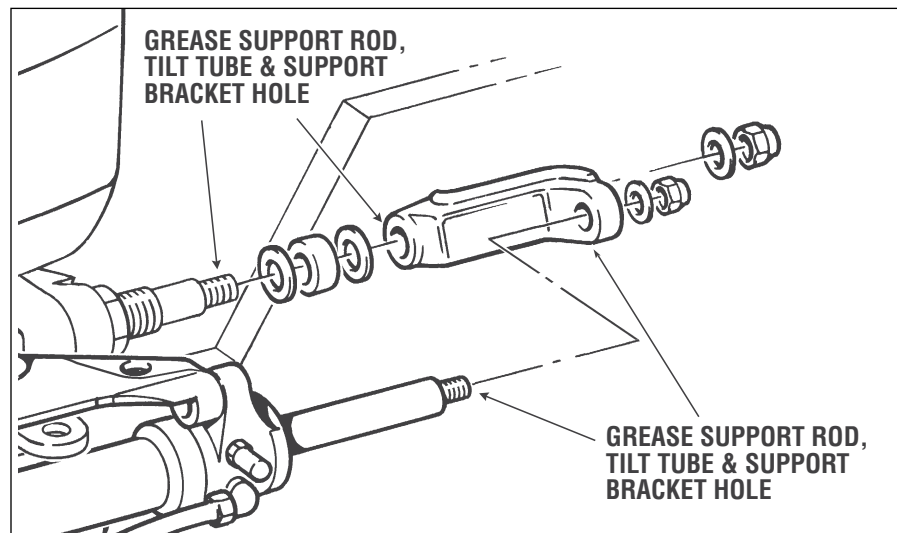


Figure 7-1. Grease points on cylinder mounts.

7.3 Replacement Parts

7.3.1 SeaStar Electronic Power Steering Fluid

The Optimus Steering System is designed for use with genuine SeaStar Electronic Power Steering Fluid.

Quart HA5482

For a comprehensive listing of part numbers, please refer to the Optimus 50 Installation Manual, part no. 682100.

8.0 TROUBLESHOOTING GUIDE

WARNING

WHENEVER, IN THE FOLLOWING TEXT, A SOLUTION CALLS FOR REMOVAL FROM VESSEL AND/OR DISMANTLING OF STEERING SYSTEM COMPONENTS, SUCH WORK MUST ONLY BE CARRIED OUT BY A QUALIFIED MARINE HYDRAULIC MECHANIC. SEASTAR SOLUTIONS OFFERS THE FOLLOWING AS A GUIDE ONLY AND IS NOT RESPONSIBLE FOR ANY CONSEQUENCES RESULTING FROM INCORRECT DISMANTLING OR REPAIRS.

Optimus EPS steering will provide years of safe reliable performance with a minimum of service if properly installed.

Optimus steering systems have been designed with protection against over-pressure situations, with the inclusion of a pressure relief valve and circuit breakers, to minimize the possibility of total loss of steering.

Most faults occur when the installation instructions are not followed and usually show up immediately upon filling the system. Listed below are the most common faults encountered and their likely cause and solution.

FAULT	CAUSE	SOLUTION
1. CANtrak does not turn ON?	Batteries not turned ON, or in poor working condition.	Load test batteries.
	Ignition wires disconnected.	Confirm all connections are in place.
	CANtrak connection damaged and/or not connected.	Inspect wires for damage.
2. High/Low Speed wheel turn setting not working	Tachometer is not relaying information.	Confirm Tachometer is operating properly (check connections).
	CANtrak NOT writing proper information.	Confirm that your settings have been saved. If they are not saved, contact Tech support.
3. One engine does not steer, but CANtrak display is on.	Check circuit breaker for the engine.	Reset breaker. If it immediately trips a second time look for a shorted or pinched wire or failed component.

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APPENDIX A – SPECIFICATIONS

Optimus EPS System Specifications

Operating voltage	12 VDC nominal
Current draw, average	8A per battery feed, 16A total
Current draw, maximum	55A per battery feed, 110A total
Circuit breaker rating	60A (per battery feed)
System pressure, working	500psi (3.4 MPa)
System pressure, maximum	1000psi (6.9 MPa)
Number of wheel turns	Variable from 3.5 to 8
Steering angle, outboard and sterndrive	Up to 30° in each direction
Steering angle, inboard	Up to 25° – 40° in each direction subject to steering torque requirements and tiller geometry
Fluid type	SeaStar Electronic Power Steering Fluid (HA5482)
Fluid volume	Approximately 1.5qt (1.4 l) per cylinder/pump pair
Hose type	SeaStar Pro hose (1500psi working pressure)

APPENDIX B – TRAILERING AND STORAGE

When trailering or storing an outboard boat equipped with an Optimus EPS system, install the steering lock clips to all steering cylinders as shown below. These clips keep the engines from drifting, preventing contact with other components which may result in scuffing or cowling damage. Simply center the engines and snap the clips over the cylinder shafts to install.

WARNING

ENSURE STEERING LOCK CLIPS ARE REMOVED BEFORE OPERATING BOAT. FAILURE TO REMOVE STEERING LOCK CLIPS WILL RESULT IN NO STEERING CONTROL.

Alternatively, or if the clips are not available, steer the engines all the way to one side after tilting them up. The weight of the engines will keep them from shifting.

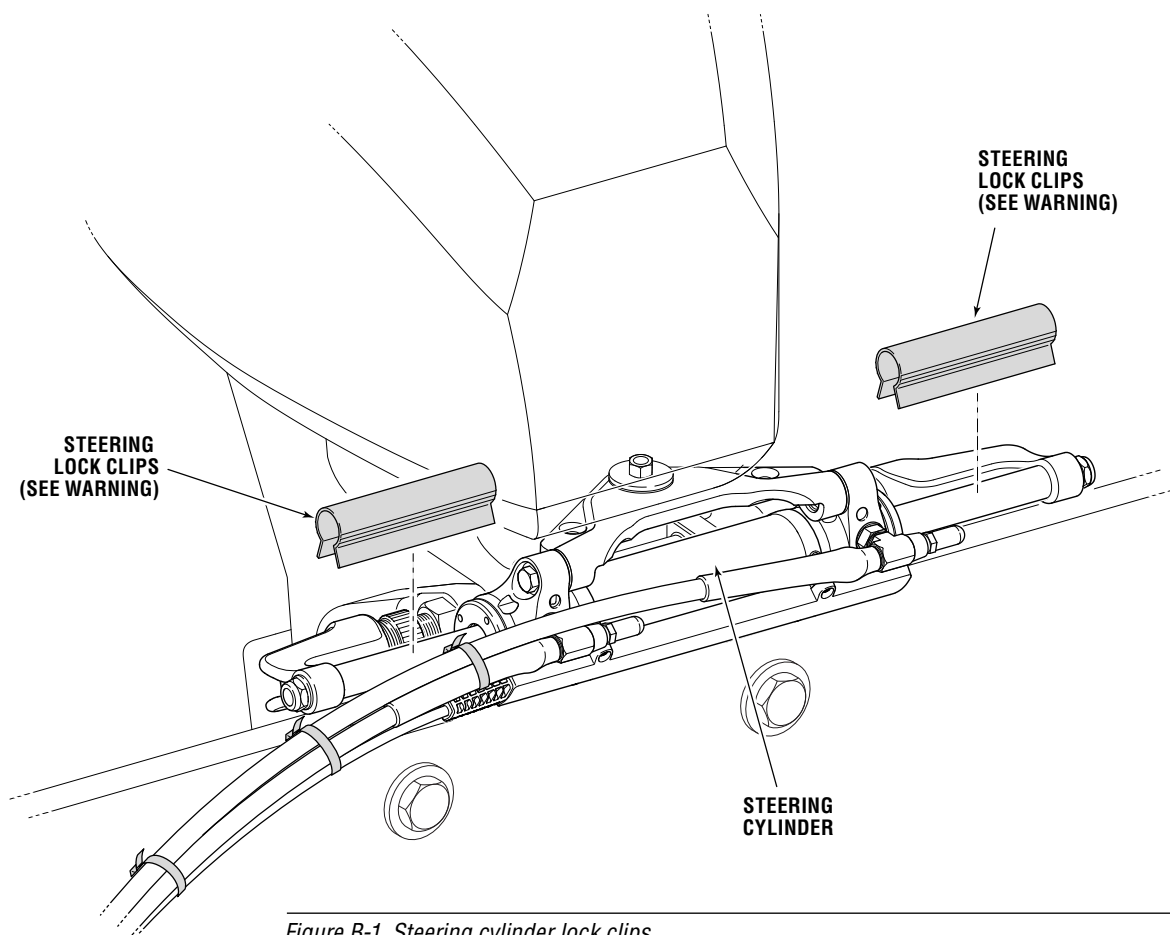


Figure B-1. Steering cylinder lock clips.

WARRANTY

Statement of Limited Warranty

We warrant to the original retail purchaser that **Marine Canada Acquisition Inc. DBA SEASTAR SOLUTIONS** (herein forward referred to as **SeaStar Solutions**) products have been manufactured free from defects in materials and workmanship. This warranty is effective for two years from date of purchase, excepting that where **SeaStar Solutions** products are used commercially or in any rental or income producing activity, then this warranty is limited to one year from the date of purchase.

We will provide replacement product without charge, for any **SeaStar Solutions** product meeting this warranty, which is returned (freight prepaid) within the warranty period to the dealer from whom such product were purchased, or to us at the appropriate address. In such a case **SeaStar Solutions** products found to be defective and covered by this warranty, will be replaced at **SeaStar Solutions'** option, and returned to the customer.

The above quoted statement is an extract from the complete **SeaStar Solutions** products warranty statement. A complete warranty policy is available in our **SeaStar Solutions** products catalogue.

Return Goods Procedure

Prior to returning product to **SeaStar Solutions** under warranty, please obtain a *Return Goods Authorization number* (claim number).

Be sure to label the goods with:

- a) the name and address of the sender, and
- b) the return goods authorization number (claim number)

Please address the returned goods as follows:

From U.S.A.

RGA # ?
SeaStar Solutions
c/o UPS–Supply Chain Solutions Inc.
Door A37
1201 C Street NW, Auburn, WA,
98001

From Canada

RGA # ?
SeaStar Solutions
3831 No. 6 Road
Richmond, B.C.
Canada V6V 1P6

Technical Support

Phone: 604-248-3858

email: seastar@seastarsolutions.com

Hours: Monday to Friday 05:00 – 15:30 PST

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